

## CHAPTER 1

### INTRODUCTION

#### 1.1 Background of Study

The global average shows the temperature is increase  $0.6^{\circ}\text{C}$  in the past three decades and also increased to  $0.8^{\circ}\text{C}$  in the past century because of human activities (Hansen et al., 2006). Global temperatures have increased by  $0.2^{\circ}\text{C}$  per decade over the last three decades, possibly leading to an acceleration of the global water cycle with more intense rainfall events, more severe and widespread droughts and regional humidity variations. Regional droughts are also tightly coupled to sea surface temperature variations, and regional water availability variations can explain a significant proportion of the variations in burned area (Williamson et al., 2015). The characteristics of droughts and heat waves will also be altered as anthropogenic warming continues (Tangang et al., 2012). Wildfires can increase runoff and erosion by several orders of magnitude (Diaz-Fierros et al., 1987). Climate, vegetation, and topography of the burnt area control the resilience of the soil system and some fire-induced changes can even be permanent (Certini, 2005). Low to moderate severity fires, such as most of those prescribed in forest management, promote renovation of the dominant vegetation through elimination of undesired species and transient increase of pH and available nutrients. No irreversible ecosystem change occurs, but the enhancement of hydrophobicity can render the soil less able to soak up water and more prone to erosion. Severe fires, such as wildfires, generally have several negative effects on soil (Certini, 2005). They Regional droughts are also stiff to sea surface temperature variations and regional water availability variations can explain an important the proportion of the variations in burned area (Girardin & Wotton, 2009). Climatic changes are involved in global fire variations and also are expected to increase fire season severity over the coming decades (Flannigan et al, 2013). In burned areas, it is very difficult to determine the effect of soil water repellency on surface erosion rates

because high severity fires also remove protective layer and expose the mineral soil to rain splash. The removal of the litter layer also reduces the surface roughness and increases the velocity of overland flow, which will further increase the surface erosion rates. In steeper terrain that burned at high severity, the wet table surface soil layer can become saturated, and the increased pore pressures will decrease the shear strength and lead to the downslope movement of soil by mass failure (Debano, 2000). The soil-water characteristics curve (SWCC) can be used to estimate the different of parameter which is used to analyse soil behaviour. In this study, the suction- water content soil water characteristics curve and shear strength of soil were established.

## **1.2 Problem of Statement**

Wildfires may produce several changes in the short and long term in the landscape and in the soil system. The magnitude of these changes induced by fire in the components of ecosystems such as water, soil and vegetation are depends on fire properties and environmental factors. The most important impacts on soils in the short term are the reduction of shear strength and vegetation cover which are increases soil erosion. Changes in soil properties affect the SWCC which is important in process-based hydrologic. In this research, the changes in soil properties between burned and unburned soil were investigated. Besides, the differences in SWCC and changes in shear strength of burned and unburned soil were established.

## **1.3 Research Objective**

The objective of this study were as follow

- I. To determine the properties of soil of unburned and burned soil.
- II. To establish the soil water characteristics curve for burned and unburned soil.
- III. To determine the shear strength of burned and unburned soil at varying water content.

## **1.4 Scope of Study**

In this study, the soil sample obtained from hillside at Jalan Gambang, Kuantan was considered. Sampling of soil samples were obtained at a site affected by wildfire. Burned and unburned soil sampling was obtained from natural slope at Jalan Gambang in Kuantan. Several test were conducted to investigate the properties of unburned and burned soil. In this research, the soil water characteristics curve for burned and unburned soil were determined and the technique were used which are chilled-mirror dew point technique and osmotic technique. In this study shear strength of burned and unburned soil also are determined at varying water content by vane shear test and direct shear test.

## **1.5 Significant of Study**

Significance of this study is to understand behaviour and analyse the property of shear strength which is provide soil stability be related the shear failures such as bearing capacity and lateral pressure on earth's retaining structure. The shear strength is most important property to the soil. Shear strength is a term that used in soil mechanics to determine magnitude of the shear stress that a soil can be permanently. Mostly, the shear strength of a soil mass is essentially made up of due to the interlocking of the grains the structural resistance of the movement of the soil is very essential. An other important component is the frictional resistance between the individual soil grains at their contact point on sliding. In this study, the properties of soil were conducted for the first step and follow by determine the soil water characteristics curve. Then, the shear strength also were conducted by vane shear test and direct shear test. Hopefully, the result in this study can be used for future engineer as their guideline.

## **1.6 Thesis Outline**

The thesis is divided into five consecutive chapters.

Chapter 2 explains the climate change were effect of fire on properties of soil and soil shear strength. It also presented the previous researches on the effect of fire on properties and its effect on soil-water characteristics curve at different water content.